

# Status of FESAC Long Range Planning Subcommittee

FESAC Meeting, June 23, 2020

Troy Carter  
on behalf of the subcommittee

# Why are we here: 2018 FESAC Charge

- Charge from Steve Binkley (Dec 2018): FESAC-led long range planning activity for FES
- Charge covers entire FES portfolio: “...should identify and prioritize the research required to advance both the scientific foundation needed to develop a fusion energy source, as well as the broader FES mission to steward plasma science.”

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- Two part process, modeled after the P5 (Particle Physics Projects Prioritization Panel) and the Nuclear Physics planning process (NSAC)
  - Letter indicates that APS DPP will lead the first phase (DPP Community Planning Process) of community-led activities (done)
  - Phase 2, led by FESAC/FESAC Subcommittee, will take input from Phase 1 to develop the final long range plan

# FESAC Charge Language

- Identify specific research areas, across the entire portfolio, in which the U.S. should establish or enhance global leadership
- Maintain a healthy and flexible program, which incorporates the roles and contributions of universities, national laboratories, and industry, to deliver science results through next decade
- Maintain, upgrade, and/or pivot current small-, mid-, and large-scale facilities, including DIII-D and NSTX-U, and also initiate new experiments/facilities/projects
- Identify international collaborations and partnerships giving U.S. scientists access to devices with unique capabilities
- Provide support for private-public partnership ventures
- Position U.S. to obtain maximum benefits in ITER burning plasma science era
- Considering budgetary constraints, technical readiness and feasibility for any activity to proceed.

# Budget Scenarios

- “Your report should provide recommendations on the priorities for an optimized FES program over the next ten years (FY 2022-2031) under the following three scenarios with the FY 2019 enacted budget for the FES program as the baseline:”
  - Constant level of effort (with OMB inflators = **2.2%** yearly growth)
  - Modest growth (2% above OMB inflators = **4.2%** yearly growth)
  - Unconstrained, but prioritized

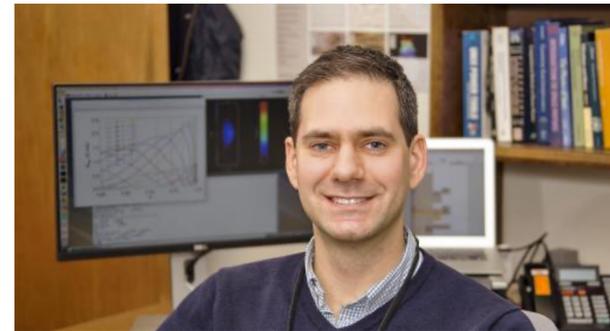
# Extremely successful Phase I, thanks to CPP Co-Chairs, PC Members, and the entire Community

## A Community Plan for Fusion Energy and Discovery Plasma Sciences

Report of the 2019–2020 American Physical Society Division of Plasma Physics Community Planning Process



Prof. Scott Baalrud



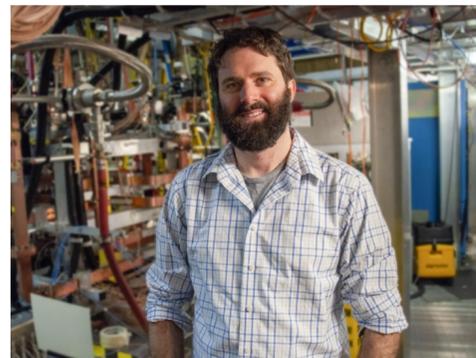
Dr. Nathan Ferraro



Dr. Lauren Garrison



Prof. John Sarff



Dr. Nathan Howard



Prof. Carolyn Kuranz



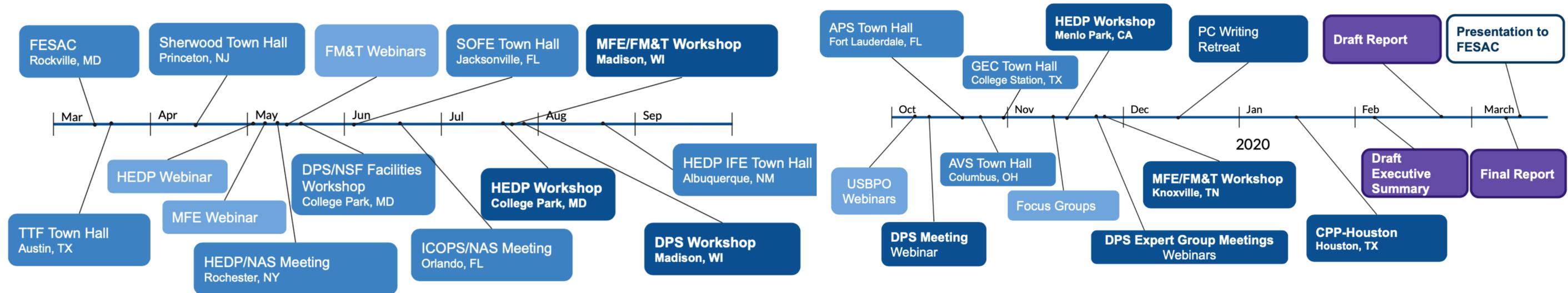
Prof. Earl Scime



Dr. Wayne Solomon

# CPP process resulted in community-led, consensus report

## Events During the CPP



- Year-long community-led process. Whitepapers, webinars, town halls and 5 major workshops; **Open process, with community review/vetting of draft reports**
- Provides guidance for prioritization within Fusion Science and Technology (FST) (MFE, FM&T & IFE) and within Discovery Plasma Science (DPS) (GPS, HEDP); also considered four cross-cutting areas (Theory/Computation, Workforce, Diagnostics, Enabling Technology)

# Why is consensus important? Look to P5 success

- The P5 planning process for DOE High Energy Physics is held up as an example for how strategic planning should be done within DOE
- Success tied to two things
  - Conveys compelling scientific opportunities and clear, prioritized plan to exploit these opportunities
  - Strong backing for the report from across the entire community
- **The HEP community was able to “speak with one voice” in support of the plan.** Large number of endorsing signatures to final report, more importantly voices across the community signaled support for the plan to DOE, NSF & Congress



- **Thanks to the efforts of many:**
  - **Community letter organized by DPF and Users Organizations, >2000 signatures gathered in 1<sup>st</sup> week**
    - **an important message given our earlier reputation as a “fractious” community**
  - **A sustained sequence of rollout activities:**
    - **interactions with decision makers and outreach to other fields**

During the late summer of 2013, the DOE and NSF charged the High Energy Physics Advisory Panel (HEPAP) to constitute a new Particle Physics Project Prioritization Panel (P5) with a goal of developing a 10-year strategic plan for U.S. particle physics in the context of a 20-year global vision. P5 recently completed its work and its report was unanimously endorsed by HEPAP on May 22, 2014. As scientists, engineers, and students from 144 U.S. universities and laboratories, we write to express our strong support for the P5 Report.<sup>1</sup> This plan describes a world-leading program of discovery and we urge that it be incorporated into the plans of the DOE and the NSF.

The report proposes a compelling and balanced strategy of exploration and discovery. The funding profile is realistic. By following it, we will maintain our historic position as a global leader and reliable international partner in this exciting science. The plan invests in the strengths of the US Particle Physics Community, optimizing our resources to address the five critical and intertwined science drivers identified by P5: to exploit the Higgs boson as a new tool for discovery; to pursue the physics associated with neutrino mass; to identify the physics of dark matter; to understand cosmic acceleration, dark energy and inflation; and to explore the unknown, new particles, new interactions, and the principles that govern them.

The P5 report relies on the work of an extensive community study (“Snowmass”) commissioned by the Division of Particles and Fields of the American Physical Society, our professional society of particle physics. Over the course of a year a thousand members of our community, organized in dozens of far-flung working groups, considered the scientific opportunities in depth covering all areas of our field. This work culminated in a 10-day meeting in August 2013 where the comprehensive documentation for P5’s deliberations was completed. Then over the subsequent nine months, P5 held multiple face-to-face and virtual community meetings, and maintained an active website for community input. The resulting P5 report distilled the accumulated wealth of scientific opportunities into those that best serve the science drivers, while also making hard choices among many outstanding scientific programs. Support among our community has solidified behind this exciting report as witnessed by our attached **2095 signatures gathered in seven days**: we stand behind the P5 plan.

Now that our community has reached consensus, we look to you for the necessary support to execute this plan that will enable us to maintain and enhance our position as global leaders in this exciting program of discovery science and technological innovation.

Sincerely,  
The U.S. Particle Physics Community

cc: Dr. France A. Córdova, Director, National Science Foundation  
Dr. Patricia Dehmer, Director, U.S. Department of Energy Office of Science  
Dr. Denise Caldwell, Director, Physics Division, National Science Foundation

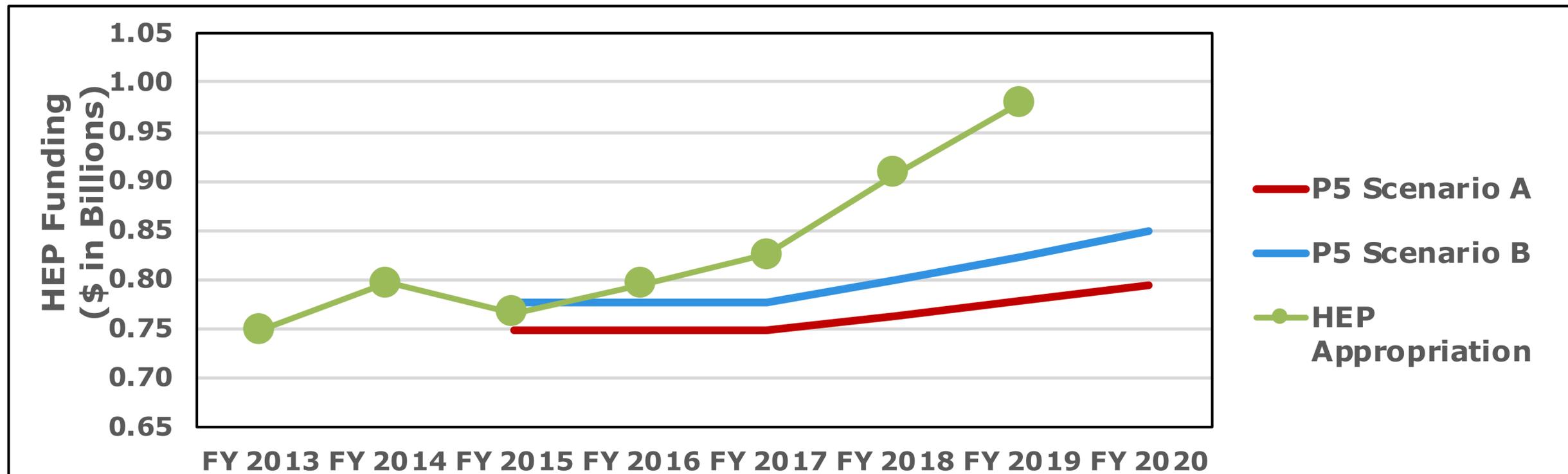
<sup>1</sup> <http://usparticlephysics.org/p5/>

# Not just signatures: real impact on support for the field



## Consensus has paid off in high energy physics (P5)

- FY 2019 Senate Energy and Water Development Appropriations Report:
  - “The Committee recommends \$1,010,000,000 for High Energy Physics. The Committee strongly supports the Department’s efforts to advance the recommendations of the Particle Physics Project Prioritization Panel Report [P5], which established clear priorities for the domestic particle physics program...”



**Our goal: a strategic plan that can have the same impact via broad support from the FES-funded research community**

# The FES portfolio more intellectually diverse (and more diverse in stakeholders) than HEP

- Plasma/fusion science and engineering is broad, interdisciplinary with varied applications (e.g. fusion, semiconductor processing, plasma accelerators, ...) (see CPP report and Plasma 2020).
- APS DPP was chosen to lead CPP, however the FES-funded community spans many additional professional organizations
- ANS Fusion Energy Division, IEEE Nuclear & Plasma Sciences Society, APS DAMOP (Gaseous Electronics Conference), APS DPF & DPB (beams/plasma accelerators), American Geophysical Union, ...
- Strong ties to industry: fusion (Fusion Industry Association), processing, aerospace, medical applications, ...
- Makes our task more difficult but also presents an opportunity: broad endorsement across these communities would send a powerful message

# CPP went further than HEP community process

- Phase I for HEP: single major workshop (10-day “Snowmass”) to identify scientific opportunities (preceded by work in advocacy groups), report by organizers identified major scientific questions
- P5 (HEP Phase 2) organized workshops, webinars, town halls to refine this input — but prioritization was developed by the P5 panel (could not vet with community due to FACA committee rules). Final P5 report was peer reviewed by key members of the community.
- **CPP went through the equivalent of the P5 workshops/webinars/town halls, resulting in consensus, community reviewed guidance on prioritization in subareas prior to the Phase 2 handoff.**
- The next P5 process (starting now) acknowledges the need for more peer review in the community/APS-led phase

# Phase 2: FESAC Long Range Planning Subcommittee



Prof. Scott Baalrud



Prof. Riccardo Betti



Prof. Troy Carter



Prof. John Cary



Dr. Tyler Ellis



Prof. John Foster



Dr. Cameron Geddes



Dr. Ariana Gleason



Dr. Chris Holland



Dr. Paul Humrickhouse



Dr. Chuck Kessel



Dr. Ane Las



Dr. Tammy Ma



Dr. Rajesh Maingi



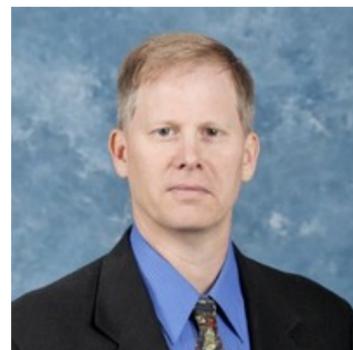
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Prof. Oliver Schmitz



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Dr. Lance Snead



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Prof. Anne White

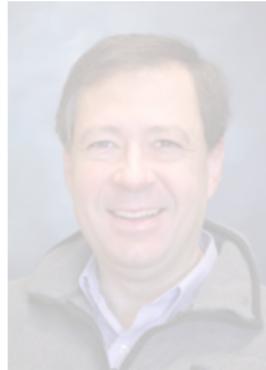


Dr. Don Rej (ex officio)

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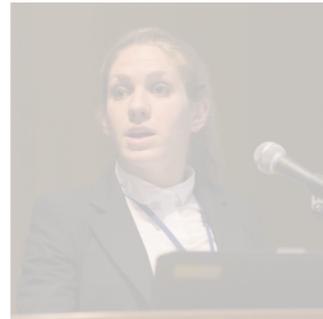
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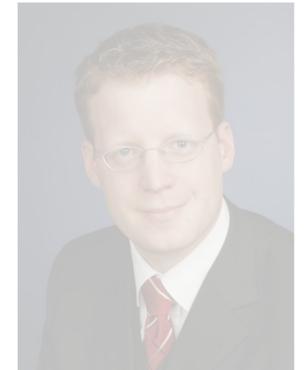
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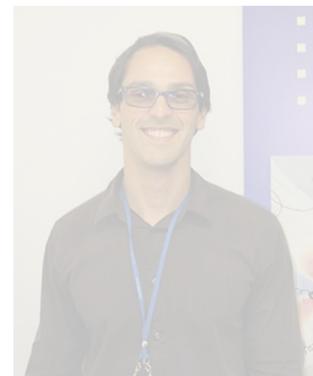
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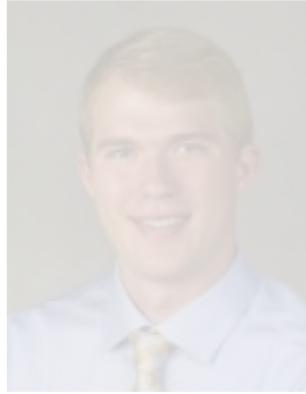
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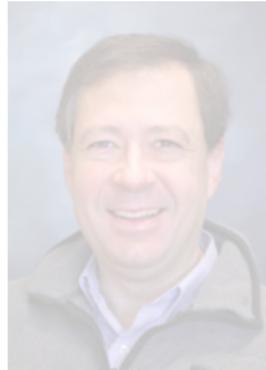
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Discovery Plasma Science Leaders

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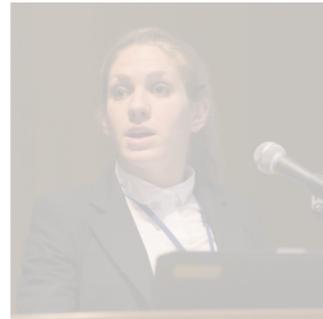
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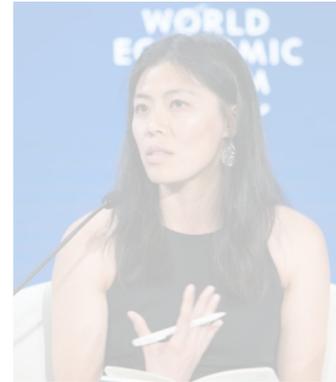
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Prof. Anne White



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Fusion Science and Technology Leaders

# Others who are critical to the committee's work

- **Laurie Moret** played a key role in enabling the success of the CPP process as a strategic planning consultant, continues in that role with the LRP subcommittee
- **Sam Barish** will be our FES Liaison for this process
- The subcommittee is working with two project management experts (plus others working with them) to get costing information:
  - **Jeff Hoy** (DOE, retired), **Carl Strawbridge** (ORNL, retired)
  - Both Jeff and Carl have extensive experience with large DOE projects including ITER, Spallation Neutron Source...

# Subcommittee has been hard at work for 3+ months

- First meeting Feb 21 (Zoom); activity really picked up after the official release of the CPP report at the March 16 FESAC meeting
- Committee has still not met in person, but has logged a huge number of hours on zoom. Not atypical to have 10+ hours of Zoom a week:
  - Whole subcommittee call, DPS Subgroup Call, FST subgroup call
  - Calls for SO and PR sub-sub-groups (many)
  - Leadership calls (FST, DPS, all)
  - Costing activity calls
  - Calls with external guests
- Plus lots of offline work!

# CPP report is foundation for our work

- CPP report conveys compelling scientific & technology development opportunities, spanning fundamental science, to plasma-based technology, to urgent development of fusion power in the US
- This is the foundation of the final plan, our report will point to the CPP report
- CPP report expresses consensus prioritization guidance that is the result of significant work by the community
- **A top priority of the FESAC LRP Subcommittee is to maintain and build on that consensus so that the final plan is something that the entire FES-supported community can get behind**
- We're performing all of our work with this goal in mind

# Need to go beyond the CPP to address the charge

- The CPP accomplished a great deal and provides a wealth of information, but we need more to fully address the FESAC charge
- CPP did not attempt to address the budget scenarios, did not cost initiatives and programs
- Partnering (with other agencies, industry, internationally) important here, and represents potential additional information gathering need

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  - Partnering (with other agencies, industry, internationally) important here, and represents potential additional information gathering need
- CPP process resulted in consensus guidance for prioritization within subareas of the portfolio, but not across the entire FES portfolio
- Did not have sufficient time to have conversations between subareas so that each can understand the other's priorities and discuss how the plan can accommodate priorities across the whole portfolio

# Communications with the community during our work

- LRP Subcommittee has been mostly quiet during the first few months of work as we dug into to wealth of information from the CPP report, but we have been reaching out to the community (more in a sec) and have finally put up a public-facing website  
<https://sites.google.com/view/fesac-lrp-public/home>

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<https://sites.google.com/view/fesac-lrp-public/home>
- As a subcommittee of FESAC, our ability to communicate is constrained by DOE rules (P5 had the same problem)
- Unable to have open/community wide review of our draft work; so the communication will need to be more one-way than during the CPP
- We can't broadcast outcomes of subcommittee deliberations, but we can gather as much additional input as we need
- Can tailor input requests to inform the community on issues the subcommittee is struggling with and present options the subcommittee might be considering

# Ongoing and future communications with the community

- We have been gathering clarifying/additional information on elements of CPP report via targeted requests (trying to use CPP PC, expert groups, but also going straight to initiative authors where appropriate (e.g. costing)). **As we do this, we keep in mind the goal of maintaining consensus behind the CPP report (making sure all relevant parties are involved in the discussion)**

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- Presentations to FESAC on progress (this is the first, we plan a second in ~September) provide important opportunities to communicate and receive feedback
- **We have opened up a Google Form for feedback in response to this talk on our website**

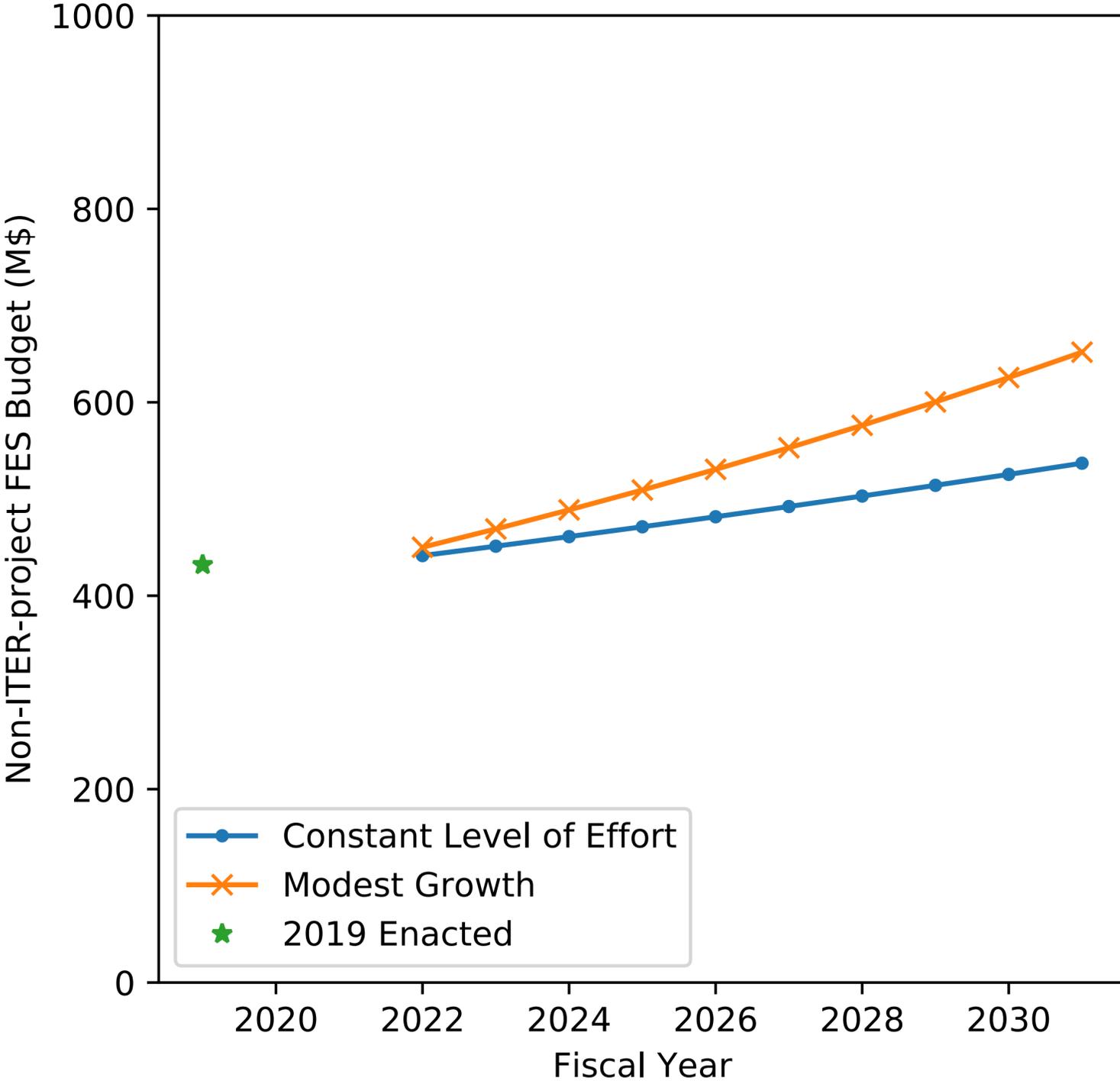
# Gathering input via guest speakers/targeted requests

- The subcommittee has invited a number of guests to meetings to gather input, so far:
- CPP Co-Chairs
- FES staff (understanding budgets)
- Other relevant reports: NAS BP (Mike Mael), NAS “Brightest Light” (Roger Falcone/Felicie Albert/Jon Zuegel) (scheduled), NAS Plasma 2020 (Mark Kushner/Gary Zank) (to be scheduled)
- Other agencies: NNSA (Ann Satsangi), NASA (Thomas Zurbuchen), NSF (Slava Lukin), ARPA-E (Scott Hsu, to be scheduled)
- PPP: Alan Lindenmoyer (NASA/COTS), Dave Petti (INL/NGNP), Adrian Collins (INL/VTR)
- Also have reached out to Fusion Industry Association; requested and received information on current and planned industry activities relevant to CPP initiatives

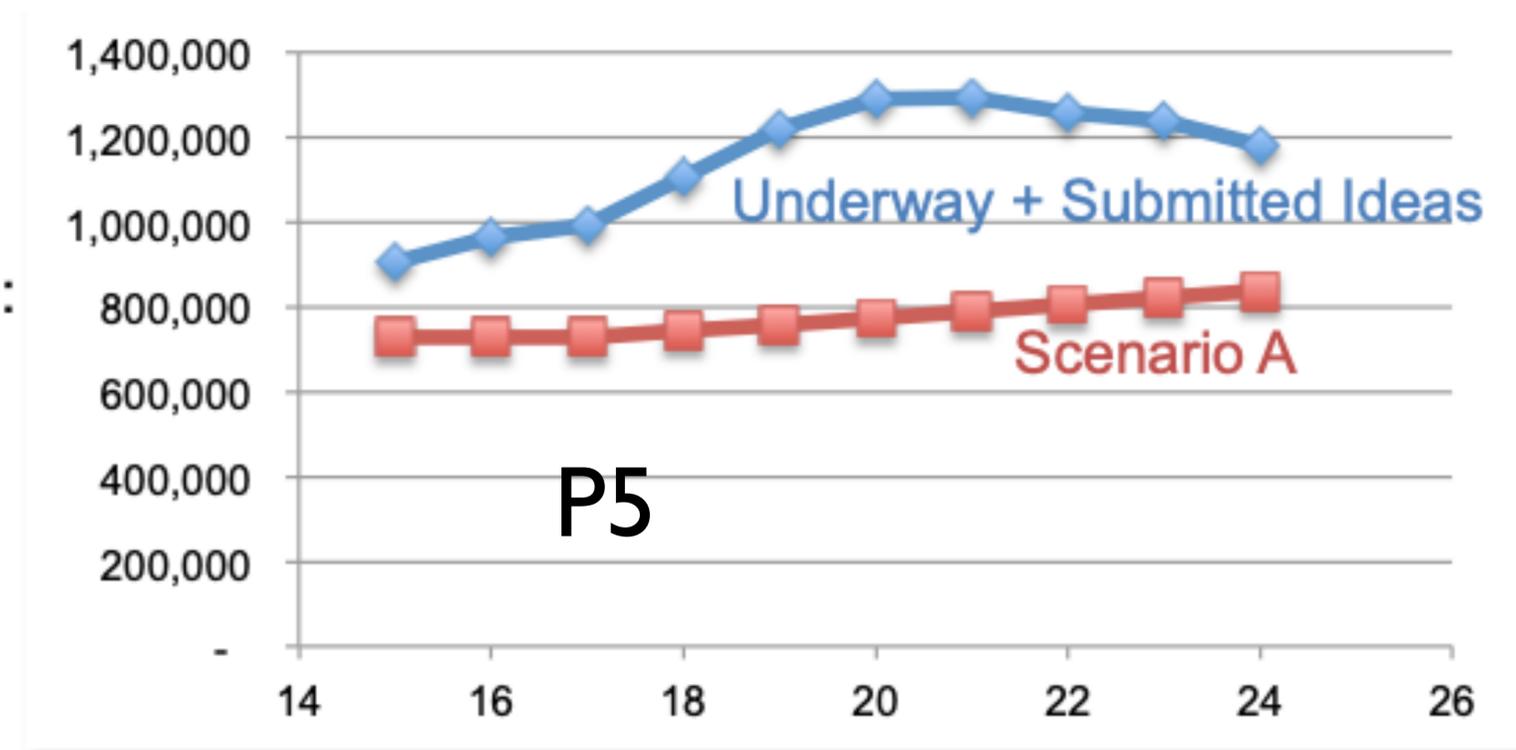
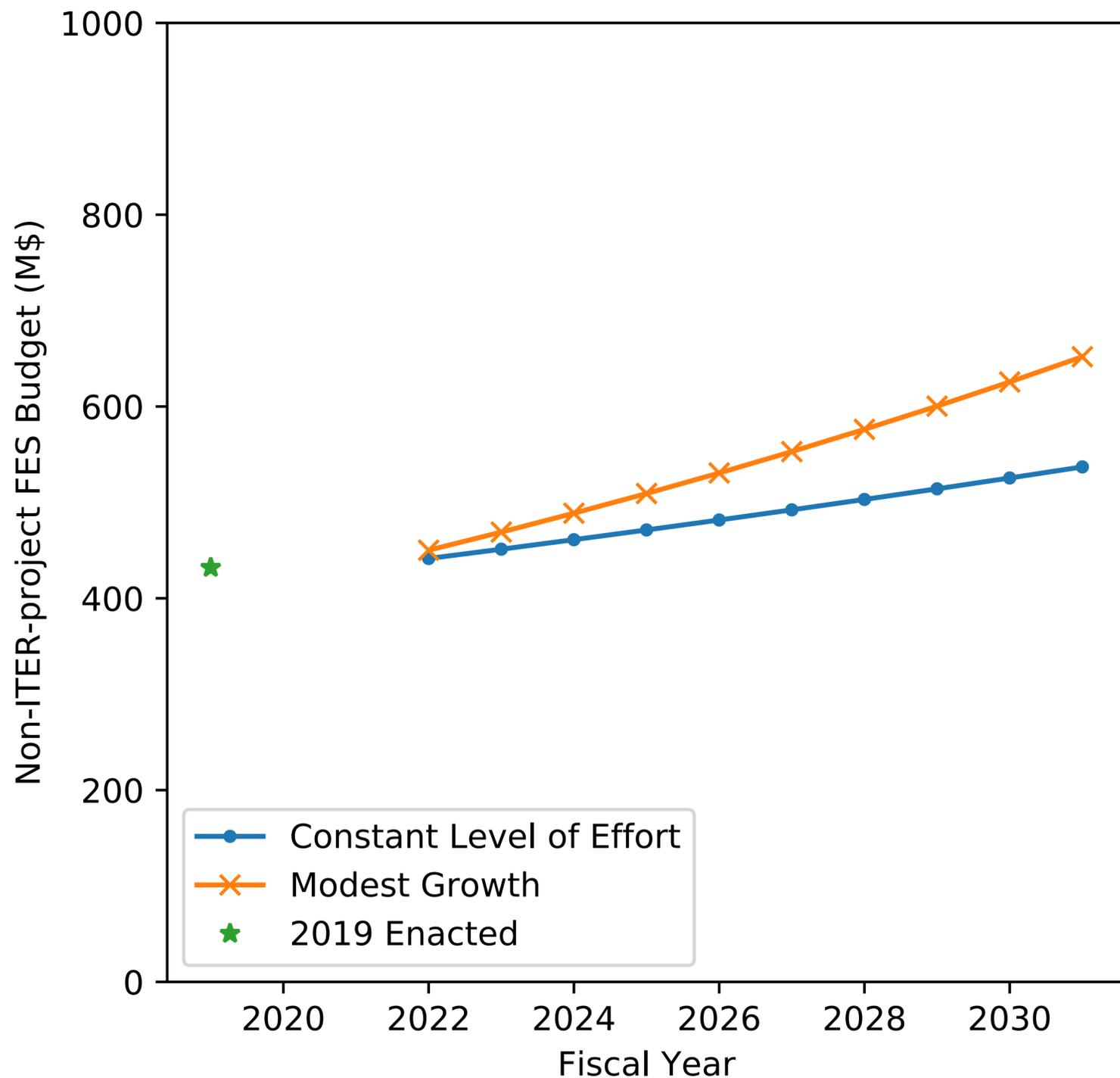
# Budget Scenarios: how we are interpreting the charge

- The FESAC charge asks us to “assume that the U.S. contributions to the ITER project will continue throughout this entire period”
- **In consultation with FES, we have decided to interpret the charge as asking us to focus on the non-ITER-project portion of the budget**
- Our starting point will be the 2019 enacted budget; we will remove the portion of the budget associated with the ITER project and the remainder will be projected forward under the budget scenarios (\$432M from 2019 enacted)
- Avoids the complication of trying to project the ITER project costs, makes the assumption that Congress will fund this appropriately without impacting the rest of the projected FES budget
- We will account for ITER operation costs (projections already provided by FES) and costs for the ITER research program

# Budget Scenarios



# Budget Scenarios



**P5 generated cost for “blue sky” will try to provide at 2nd FESAC**

# Costing strategy: Large Facilities

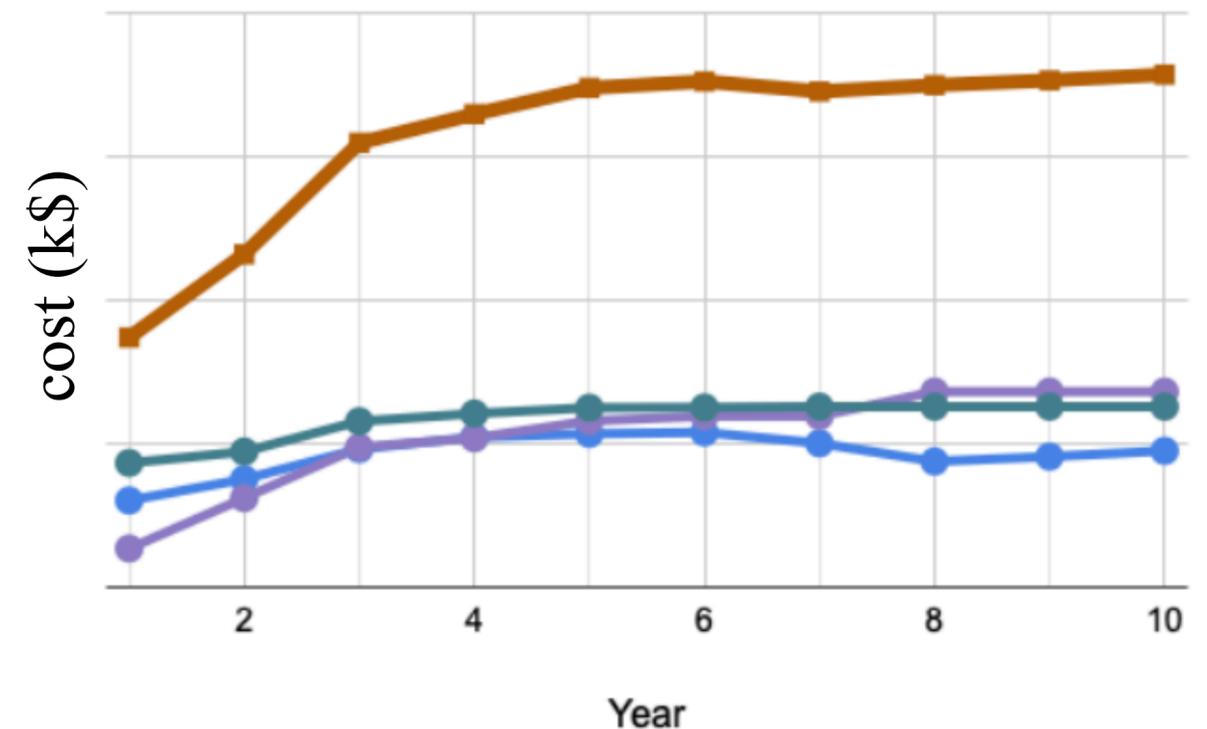
- We will estimate costs for all facilities and programs called out in the CPP report
- We will use Carl Strawbridge's and Jeff Hoy's expertise (and staff of estimators) to cost large scale facilities.
- Already hard at work on this, the following facilities are currently in their workflow (so expect to hear from them with info requests):
  - **FST**: FPNS, NTUF, Midscale Stellarator, RF Test Facility. **DPS**: MEC Upgrade. (Others are on their way, waiting on information requests, etc)
  - We will project costs for projects already in the Critical Decision (CD) process (includes MPEX (CD-1), MEC Upgrade (CD-0)).

# Costing strategy: Small Facilities and Programs

- For FST programs:
  - Estimated FTE needed to execute programs, have developed per FTE costs (for Labs, Industry, University) to use to assign costs
  - Use multiplier for personnel costs to estimate costs for materials, small experiments

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- For FST programs:
  - Estimated FTE needed to execute programs, have developed per FTE costs (for Labs, Industry, University) to use to assign costs
  - Use multiplier for personnel costs to estimate costs for materials, small experiments
  - Generating cost profiles for programs like this example (for an unnamed FST SO)
  - Also trying to be careful not to double count FTE that might be working on multiple SOs/PRs



# Costing strategy: Small Facilities and Programs

- For DPS programs:
  - Using SOs and PRs to identify programs that address the science drivers (either bolstering/continuing current programs or creating new ones)
  - Using historical data from DPS grants to understand needs in terms of number of awards and sizes of grants for different sub-communities, using this information to help set program size
  - Using historical data to also understand costs for small- to intermediate-scale facilities (in the context of recommendations for routine opportunities to propose such facilities rather than calls for specific facilities)
  - Where appropriate, also using per FTE yearly costs to estimate costs for some programs (user facilities, etc)

# FST group is producing a roadmap

- Using guidance from CPP report, FST subgroup is generating a timeline for fusion research leading to the FPP

Example, for fake SO

	Type	Start Date	End Date	FESAC charge timeline (2021-2031)	Timeline to FPP (2031-2046...)
<b>SO-X</b>					
Facility #1	Life	Oct 1, 2021	Oct 1, 2038	[Green bar]	[Green bar]
	Design	Oct 1, 2021	Oct 1, 2023	[Blue bar]	
	Construction	Oct 1, 2023	Oct 1, 2030	[Magenta bar]	
	Operation	Oct 1, 2030	Oct 1, 2036	[Purple bar]	[Purple bar]
	Decommission	Oct 1, 2036	Oct 1, 2038		[Red bar]
Facility #2	Life	Oct 1, 2021	Oct 1, 2034	[Green bar]	[Green bar]
	Design	Oct 1, 2021	Oct 1, 2023	[Blue bar]	
	Construction	Oct 1, 2023	Oct 1, 2026	[Magenta bar]	
	Operation	Oct 1, 2026	Oct 1, 2032	[Purple bar]	[Purple bar]
	Decommission	Oct 1, 2032	Oct 1, 2034		[Red bar]
Program #1	Program	Oct 1, 2023	Oct 1, 2029	[Cyan bar]	
	Labor	Oct 1, 2023	Oct 1, 2029	[Yellow bar]	
	Equipment	Oct 1, 2023	Oct 1, 2029	[Orange bar]	
Program #2	Program	Oct 1, 2021	Oct 1, 2035	[Cyan bar]	[Cyan bar]
	Labor	Oct 1, 2021	Oct 1, 2035	[Yellow bar]	[Yellow bar]
	Equipment	Oct 1, 2021	Oct 1, 2035	[Orange bar]	[Orange bar]

- Intention is to have a full roadmap, with decision points, interconnections between programs, leading to the design and construction of the FPP
- Using this to understand what falls under our purview (2022-2031) and also understand impacts of decisions driven by constrained scenarios on the timeline to the FPP

# Need to develop a strategy for a whole-portfolio plan

- CPP process didn't have sufficient time to allow the DPS and FST communities to come together, understand each other's priorities and discuss a strategy for the final plan to accommodate the ambitions of both communities

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- CPP process didn't have sufficient time to allow the DPS and FST communities to come together, understand each other's priorities and discuss a strategy for the final plan to accommodate the ambitions of both communities
- **A natural starting point is the “stay in your lane” strategy** — each area gets its own piece of the 2019 enacted budget, projected forward
- **Each area has compelling, independent reasons for growth. Does not have to be a zero sum game (if we do this right, we can grow both areas)**
- How can our plan convey this fact and accommodate the priorities of both areas while building support for the final report? **Need for community input**

# Education first: FAQs, Webinars

- Saw a need for education as a first step: to allow each community to understand the other's priorities in the CPP report
- Important for broad consensus — want the entire community to back all elements of the plan; hard to do so if you don't fully understand priorities of other parts of the community

# Education first: FAQs, Webinars

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- Important for broad consensus — want the entire community to back all elements of the plan; hard to do so if you don't fully understand priorities of other parts of the community
- Helped sponsor/advertise two Zoom seminars: US BPO Seminar by Nathan Howard focusing on FST portion, HEDSA Seminar by Carolyn Kuranz focusing on the DPS portion (~200 attendees for each)
- Generated an FAQ about the CPP report in collaboration with CPP Co-Chairs, posted to FESAC LRP website (and circulated to mailing lists)
- **Just a starting point — need for more interactions (outside this subcommittee process) if the desire is to build stronger connections within this diverse community**

# Gather input: first step, Focus Groups

- Need: (1) how to accommodate the priorities of both FST and DPS?, (2) did CPP miss DPS/FST synergies (not captured by 4 cross-cutting areas)?
- Starting point: small group discussion - Focus Groups

# Gather input: first step, Focus Groups

- Need: (1) how to accommodate the priorities of both FST and DPS?, (2) did CPP miss DPS/FST synergies (not captured by 4 cross-cutting areas)?
- Starting point: small group discussion - Focus Groups
- Unexpectedly large interest in participating, got ~2x as many as we had planned to be able to accommodate
  - 75 people participated in 7 focus groups Jun 11 & 12 (run by Laurie Moret with help from CPP Co-Chair Lauren Garrison)
  - Planning additional focus groups after FESAC, possibly a virtual workshop to allow further discussions
- **Want to let everyone have their voices heard on this issue — primary goal is to see if we can find common ground, can craft a plan that the whole community can back**

# Updating CPP criteria & values to address constrained scenarios

- Starting point: working on DPS and FST separately, using prioritization assessment criteria (PAC) expressed in the CPP report for each area
- **However, we want to modify the DPS criteria to do our work (proposal to follow)**

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- Starting point: working on DPS and FST separately, using prioritization assessment criteria (PAC) expressed in the CPP report for each area
- **However, we want to modify the DPS criteria to do our work (proposal to follow)**
- In addition to PAC (which are applied to individual facilities/programs) we also need (sub)-program-wide values (P5 called these “Program Optimization Criteria” (POC))
- **We want to express an additional value/POC that we think should apply to the whole portfolio**
- **In addition, feel that we can express a set of shared values relevant to the entire portfolio**

# Current Criteria

## *FST Prioritization Assessment Criteria*

### **1. Importance to FPP Mission**

How essential is the research enabled by this facility or program for ensuring the success of the FPP?

### **2. Urgency**

How critical is it that this facility/program is started (or continued) immediately to enable a timeline of an FPP by the 2040s?

### **3. Impact of Investment**

Does this facility/program likely provide significant scientific or technological progress relative to the investment?

### **4. Using Innovation to Lower Cost**

Does this facility/program take advantage of new innovation not previously utilized by the fusion program that could potentially lead to a lower cost pilot plant?

### **5. U.S. Leadership and Uniqueness**

Would the facility or program provide unique capabilities or make the U.S. a leader in areas that are required for the commercialization of fusion?

## *DPS Criteria*

1. Establish U.S. leadership in plasma science through world class facilities and reproducible theory, computation, and measurements
2. Create transformational applications of plasmas to benefit society
3. Maintain breadth of the research program to benefit from innovation and high risk discovery
4. Engage the entire community of stakeholders, including national laboratories, universities, and industry
5. Capitalize on the potential of interdisciplinary applications of plasma research

**Many of the above are more values than prioritization criteria**

# Proposed Prioritization Assessment Criteria

## *FST Prioritization Assessment Criteria*

### **1. Importance to FPP Mission**

How essential is the research enabled by this facility or program for ensuring the success of the FPP?

### **2. Urgency**

How critical is it that this facility/program is started (or continued) immediately to enable a timeline of an FPP by the 2040s?

### **3. Impact of Investment**

Does this facility/program likely provide significant scientific or technological progress relative to the investment?

### **4. Using Innovation to Lower Cost**

Does this facility/program take advantage of new innovation not previously utilized by the fusion program that could potentially lead to a lower cost pilot plant?

### **5. U.S. Leadership and Uniqueness**

Would the facility or program provide unique capabilities or make the U.S. a leader in areas that are required for the commercialization of fusion?

## *DPS Criteria*

- 1. Scientific Impact:** Is the facility or program well aligned with the identified science drivers? How significant would the scientific impact of the facility or program be?
- 2. U.S. Leadership:** Would the facility or program establish or maintain U.S. leadership and competitiveness in plasma science and engineering?
- 3. Societal Benefit:** Does the facility or program contribute to progress toward transformational applications of plasmas that benefit society?
- 4. Impact of Investment:** Does this facility/program likely provide significant scientific or technological progress relative to the investment? Given opportunities for partnering and other agency programs, how impactful would FES involvement in this facility or program be?

# CPP Values + one more

## ***FST Values***

1. Prioritize research most important to the *FPP Mission*
2. Act with *Urgency* to address energy security and sustainability
3. Embrace a *Culture of Innovation and Diversity*
4. Maintain *Flexibility* to benefit from innovation
5. Establish a firm Scientific Basis
6. Aspire to *U.S. Leadership*
7. Build and strengthen *International Collaboration* where beneficial
8. *Engage All Stakeholders*, including Labs, Universities, and Industry

## ***DPS Criteria (repeated as values)***

1. Establish U.S. leadership in plasma science through world class facilities and reproducible theory, computation, and measurements
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# CPP Values + one more

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Would like to add, at lowest priority (wording stolen from P5):  
**Maintaining productivity: Maintain scientific and technological progress while developing future capabilities.**

# Could express shared values with merged set of values

- The subcommittee spent some time thinking about how we might express shared values or “Program Optimization Criteria” across the whole portfolio — merging some of the FST and DPS values and criteria
- **NOT INTENDED TO BE USED TO DO WHOLE PROGRAM PRIORITIZATION, but intended to express common values as a way to bring the two communities together**

# Shared Values/Program Optimization Criteria?

- **Importance of Mission and Science Drivers:** Based on the overall program mission and the science drivers that follow from that mission, utilize a portfolio of the most promising approaches to advance science and technology and achieve our goals.
- **Urgency to address societal needs:** Fusion energy and other plasma technologies provide a compelling path to carbon-free power production and a sustainable society. Embrace the urgent need to develop and deploy these technologies, fully utilizing our scientific advances.
- **Embrace innovation and discovery:** Embrace a culture of innovation across the entire portfolio, utilizing the latest developments to address key science challenges and to identify ways to reduce the time and cost to develop plasma and fusion technology. Balance development of applications with scientific discovery, recognizing the importance of fundamental science and the direct link between scientific discovery and innovations that will benefit the entire program.
- **International Context:** Keeping in mind US strategic interests and seeking to establish and maintain US leadership, exploit opportunities to advance our science and technology wherever they may occur. Host world-leading facilities that attract participation from the international community.
- **Sustaining productivity and ensuring full stakeholder engagement:** Maintain scientific and technological progress while developing future capabilities. Fully engage all stakeholders in the program, utilizing national labs, universities and industry to make advances. In particular, recognize the important role of universities in discovery, innovation and workforce development.
- **Leveraging Partners:** Exploit the interdisciplinary nature of plasma and fusion science and the promise of fusion energy and plasma-based technologies to leverage partnerships with and joint investment from other federal agencies and private industry.

# Mission and Vision

- The CPP report expressed separate vision and mission statements for FST and DPS

## FST Vision Statement

Our vision is for fusion energy to be a major source of safe, economical, and environmentally sustainable energy in time to address critical energy and security needs of the U.S. and the world.

## DPS Vision Statement

Realize the potential of plasma science to deepen our understanding of nature and to provide the scientific underpinning for plasma-based technologies that benefit society.

## FST Mission Statement

Establish the basis for the commercialization of fusion energy in the U.S. by developing the innovative science and technology needed to accelerate the construction of a fusion pilot plant at low capital cost.

## DPS Mission Statement

Develop fundamental understanding of the unique dynamical behaviors of plasmas, demonstrate that our understanding is true, and identify opportunities where the unique properties of plasmas can be used to engineer technologies that support a growing and sustainable economy.

# Unified vision and mission?

- FES needs a single vision and mission that embraces the entire portfolio
- Current mission statement: *The FES program mission is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source.*

# Unified vision and mission?

- FES needs a single vision and mission that embraces the entire portfolio
- Current mission statement: *The FES program mission is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source.*
- A possible merged vision and mission that incorporates CPP missions & visions:
- **Vision:** *A society that is powered by clean, safe, and economical fusion energy and benefited by plasma science and engineering to advance knowledge, technology, and industry.*
- **Mission:** *Advance the frontier of plasma and fusion science, use the knowledge gained to engineer technologies which support a growing and sustainable economy and establish the basis for the commercialization of fusion energy in the U.S.*

# Report structure: maybe follow NASA rather than P5?

- As already discussed, fusion and plasma science and engineering is very different from high energy physics; the structure of the P5 report doesn't necessarily fit what is needed for our plan
- NASA is an agency with similar intellectual diversity to FES: strong mission-driven applications along side fundamental science
- We've looked at the most recent NASA strategic plan for ideas on how to organize our report — this approach would maintain separate narratives/plans for discovery science and fusion (and possibly other plasma technology) but with shared values/mission/vision
- Met with NASA Associate Administrator Thomas Zurbuchen in part to discuss how NASA strategic planning works (interesting conversation, but did not give us the “secret sauce” for strategic planning in such an organization)

# Timeline for our process

- We are well underway at this point, making good progress on assembling the “unconstrained but prioritized” plan and on costing work to allow us to address the constrained scenarios
- Will work hard this summer on constrained scenarios and give another FESAC status report late summer (early September?) and another opportunity for community feedback on our status
- Would like to have a finished draft report by early fall (Oct 1?), with the goal of having the report peer reviewed (following National Academies approach)
- Giving plenty of time for that review and response, we plan to deliver the final report as requested in Dec of this year. (note this would allow significantly more time for review compared to P5, which gave 1 week to external reviewers)

# How to stay informed/provide feedback

- FESAC LRP Subcommittee Website:
  - <https://sites.google.com/view/fesac-lrp-public/home>
- Google Form for feedback on this presentation to FESAC:
  - <https://forms.gle/P5HwxndixQvpXB4Z8>
- Join the DPP CPP mailing list for future input opportunity announcements:
  - <https://groups.google.com/forum/#!forum/dpp-cpp>
- Stay tuned for the next FESAC meeting (likely in September):
  - <https://science.osti.gov/fes/fesac/Meetings>